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The Distortional Aspect of Sensorineural Hearing Loss: What Can Be Done?

Presented by:

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The Distortional Aspect of Sensorineural Hearing Loss:

What Can Be Done?

Donald J. Schum, PhD
Vice President, Audiology & Professional Relations
Oticon, Inc.

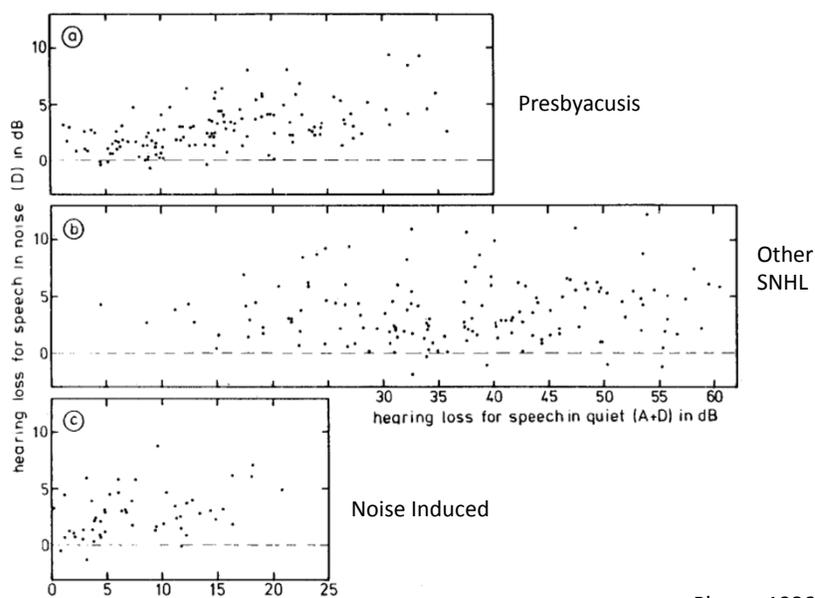
DJS@Oticonusa.com

The A & D Components of SNHL

Plomp (1986)

The A & D Components of SNHL

Attenuation plus Distortion

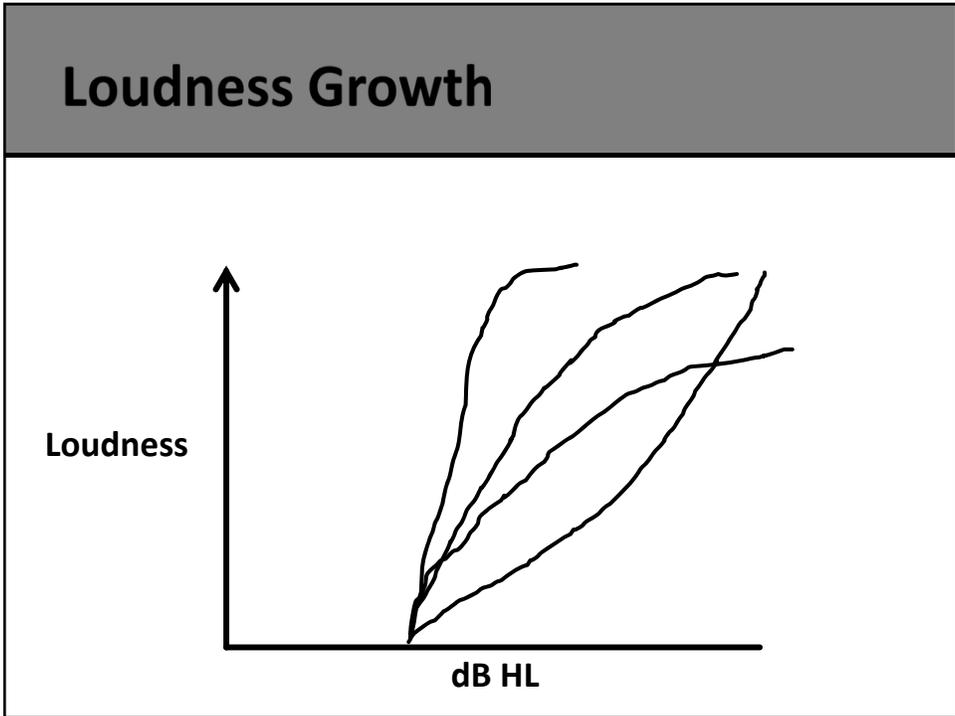


“D” in a Broader Context

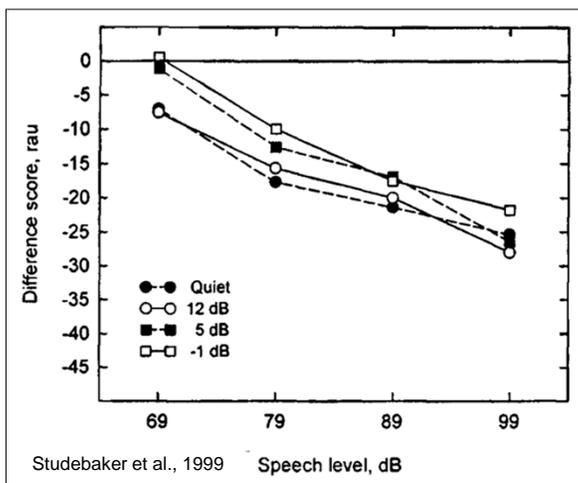
The Distortional Component of SNHL

Beyond Threshold & Loudness Changes

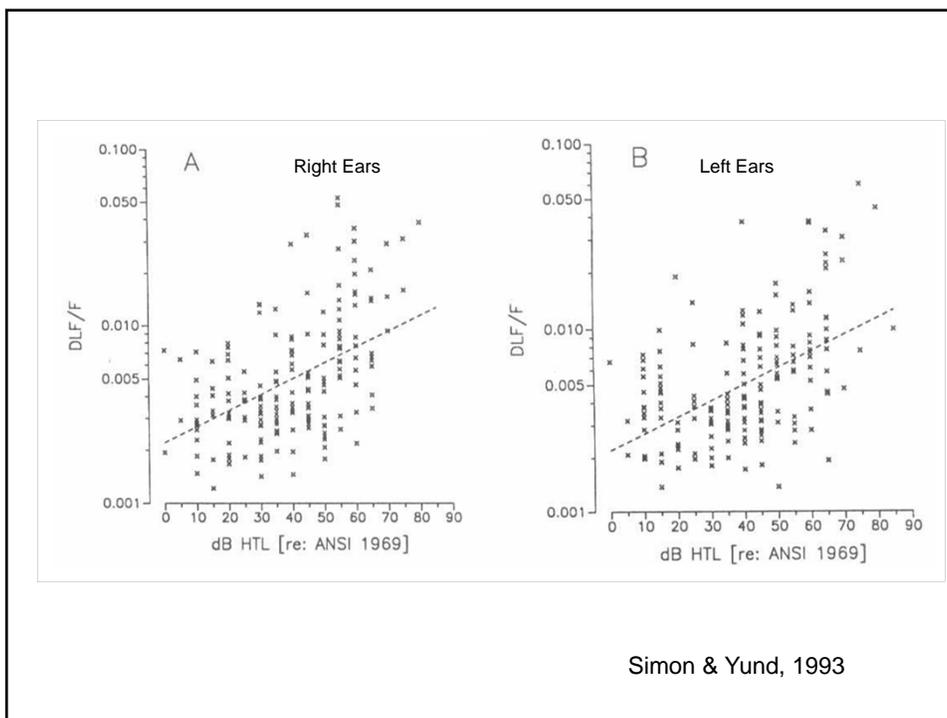
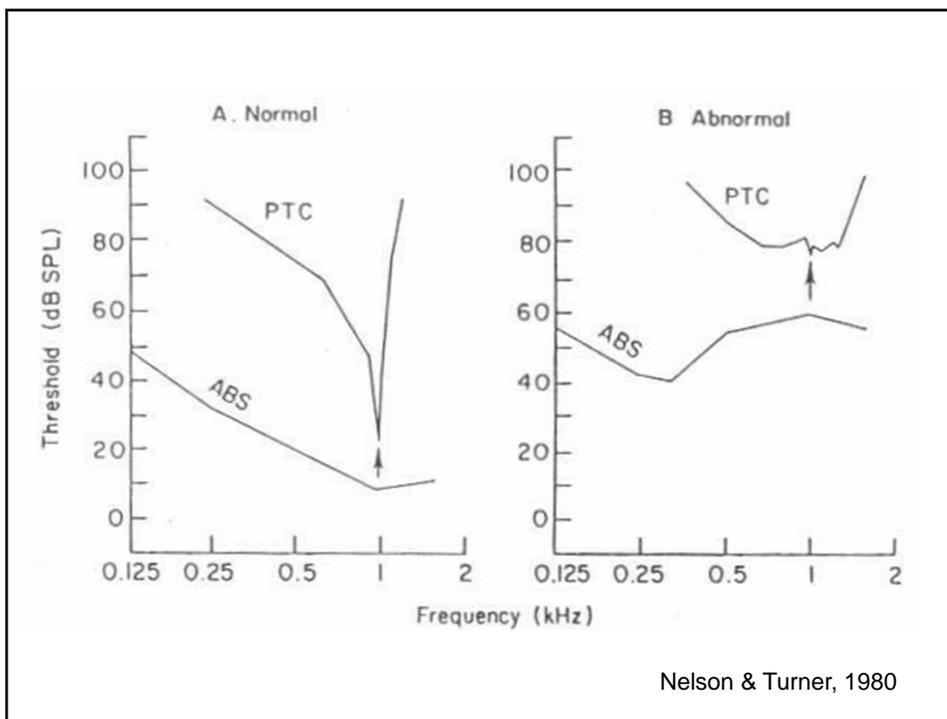
Inside the Dynamic Range



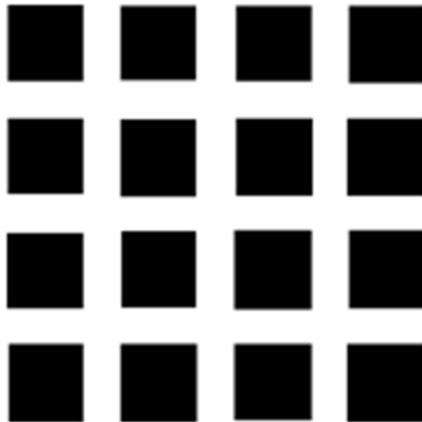
Usability of the Remaining Dynamic Range

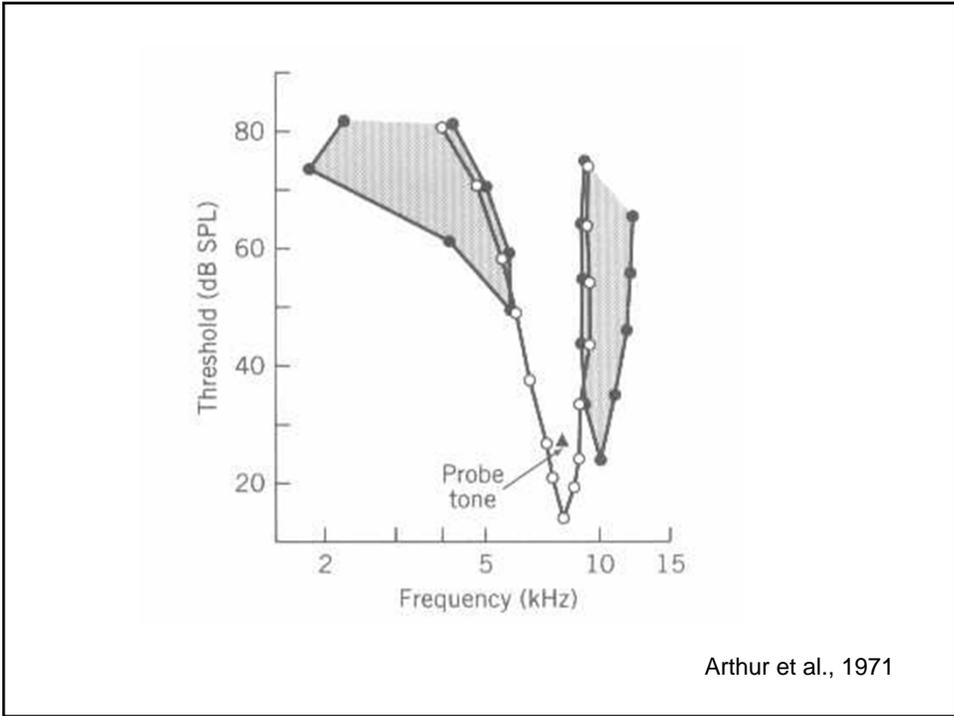


Frequency Resolution



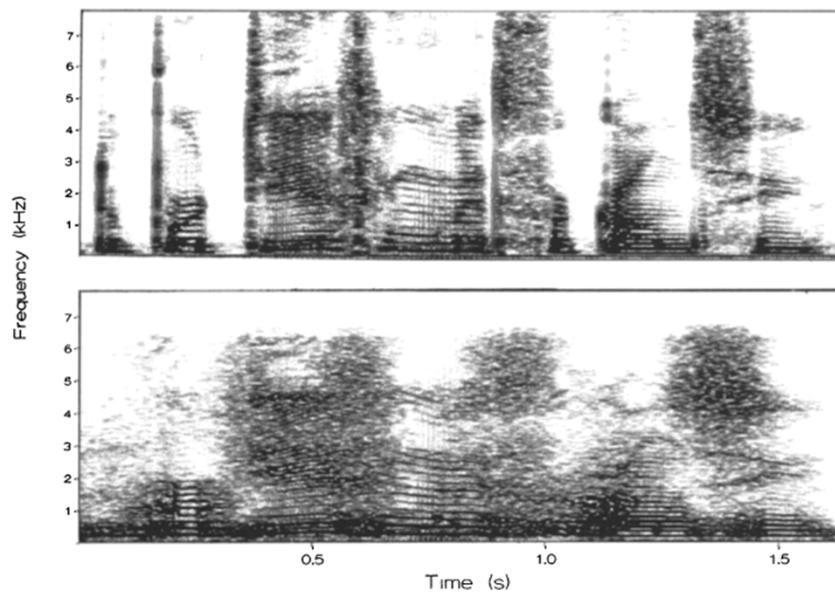
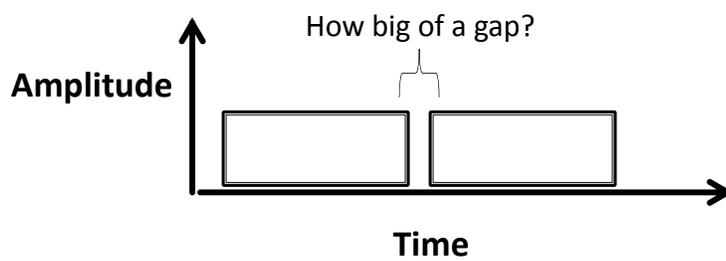
Inhibition



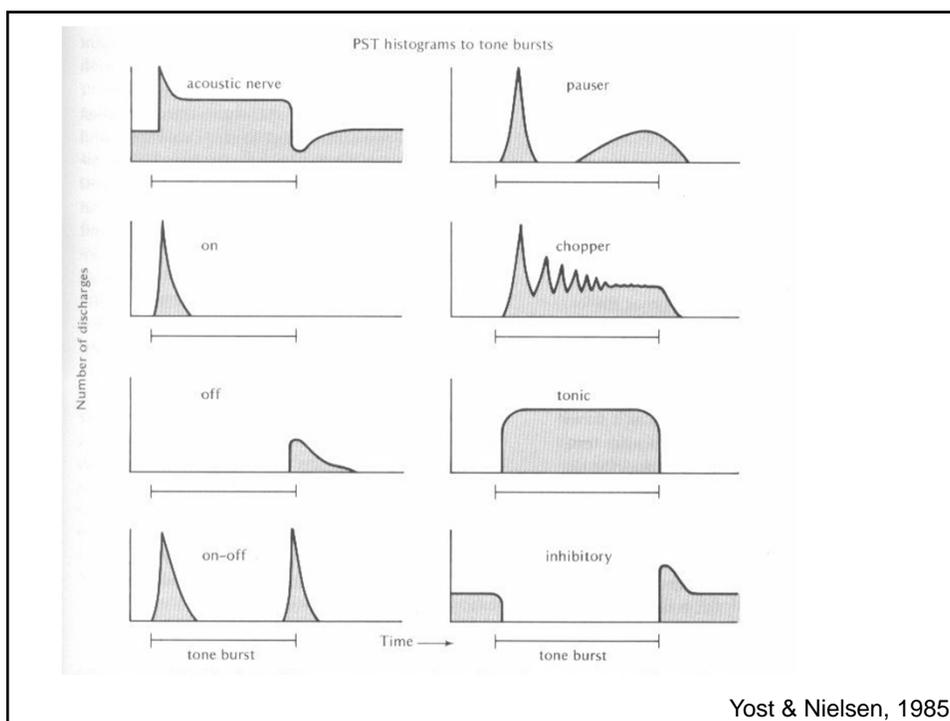


Temporal Resolution

Temporal Resolution



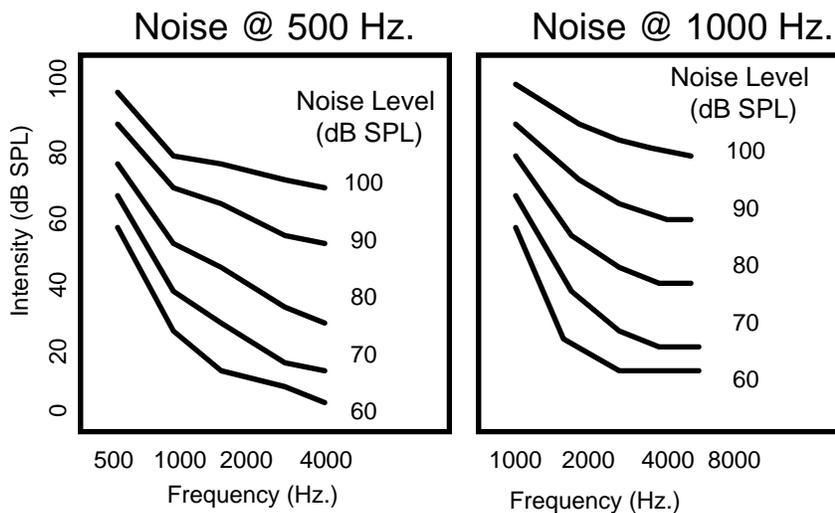
Drullman, Festen & Plomp, 1994



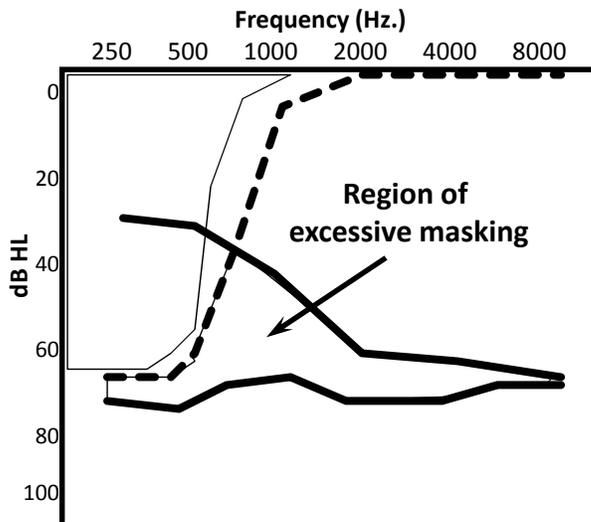
Upward Spread of Masking

Normal Hearing & USOM

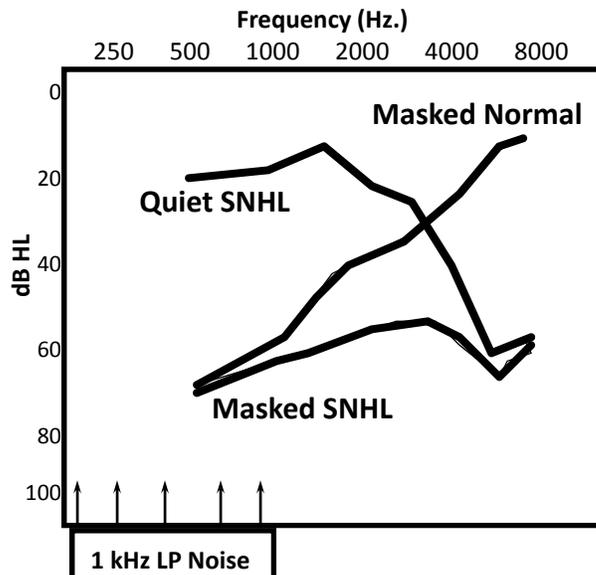
example from Gagné, 1988



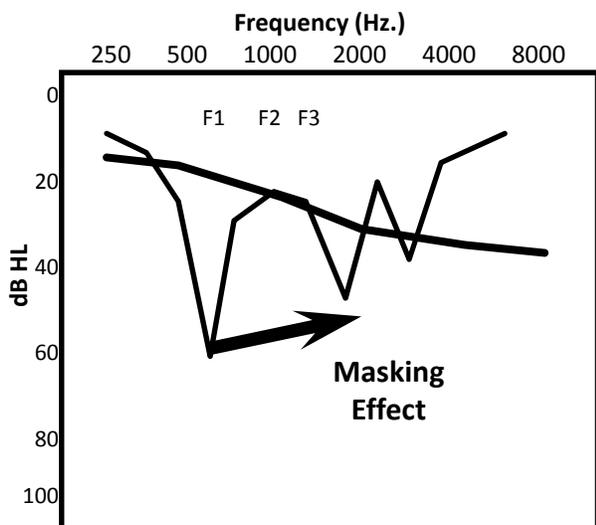
Measuring Excessive Masking



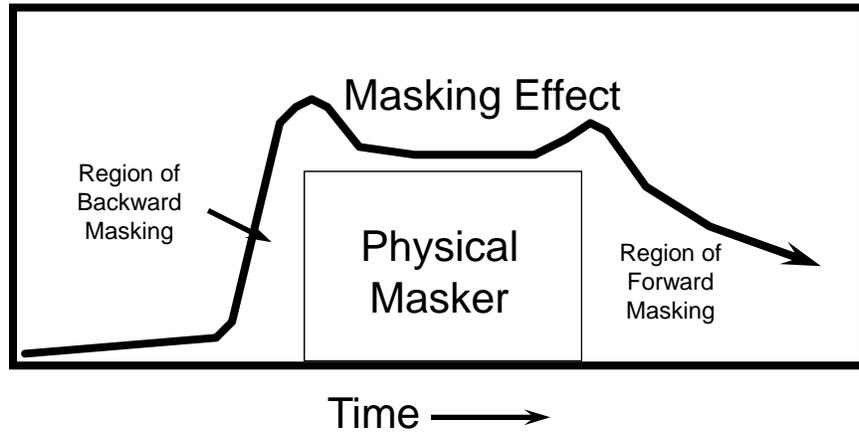
Patient with Excessive USOM
 from Klein et al., 1990



Intra Speech Masking

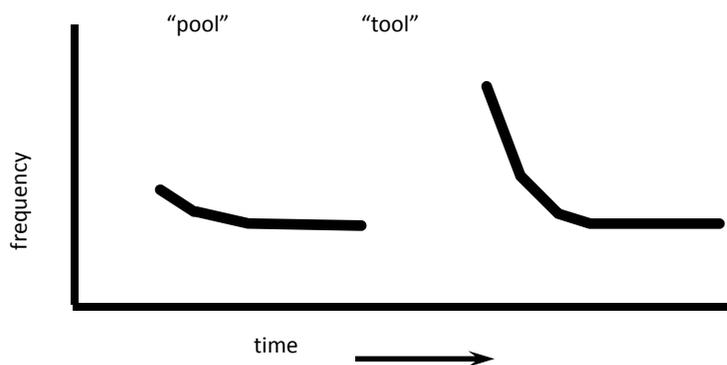


Temporal Masking



Dynamics Processing

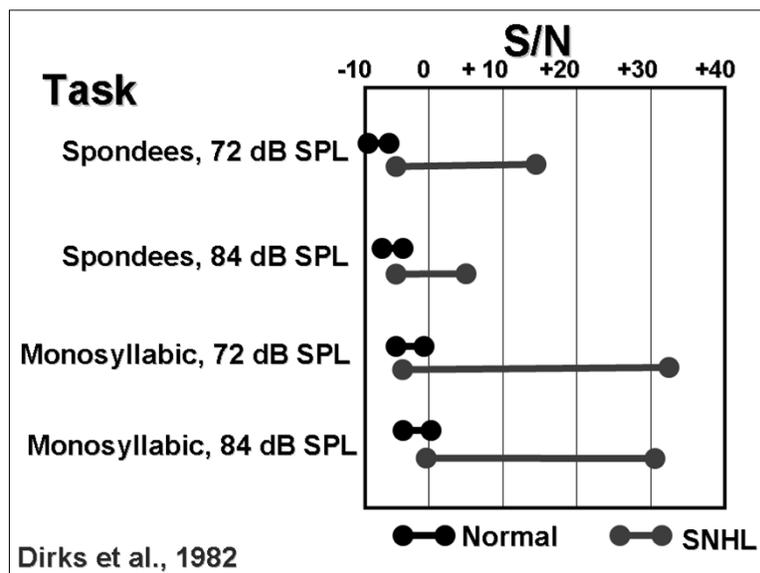
CV F2 Transition



Variability: The Norm, Not the Exception

The Distortional Component of SNHL

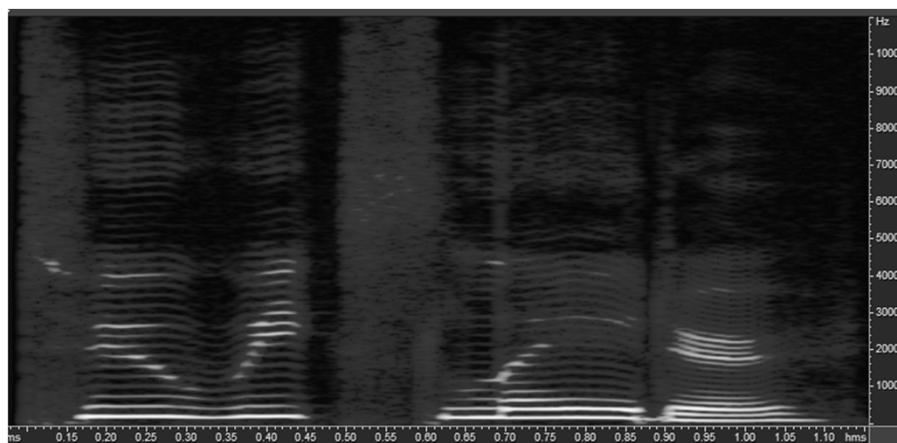
The Effect: Speech Understanding in Noise



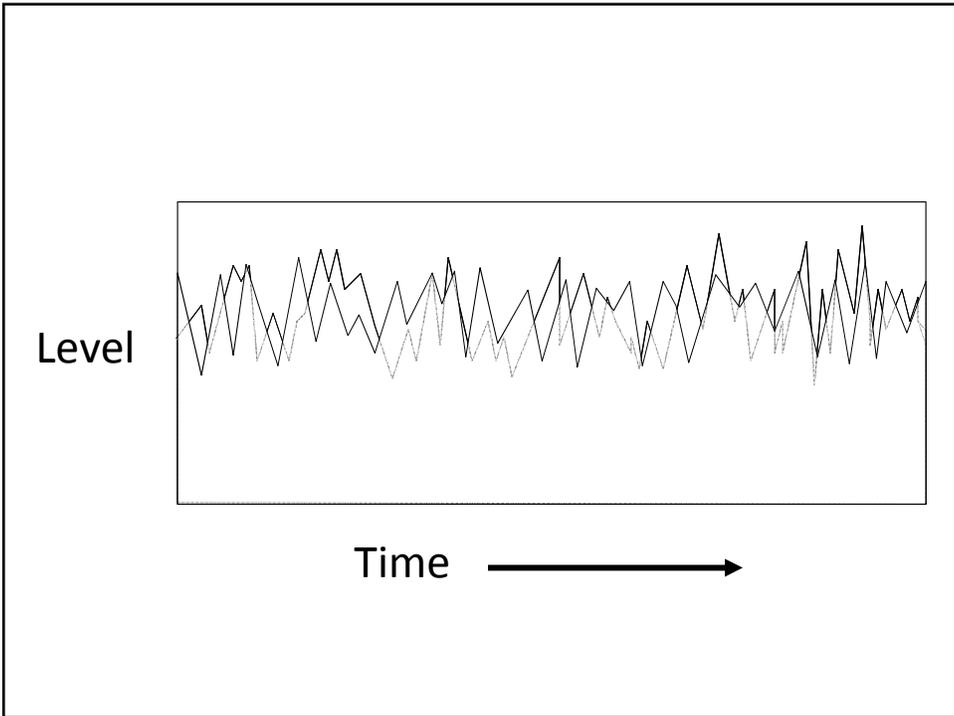
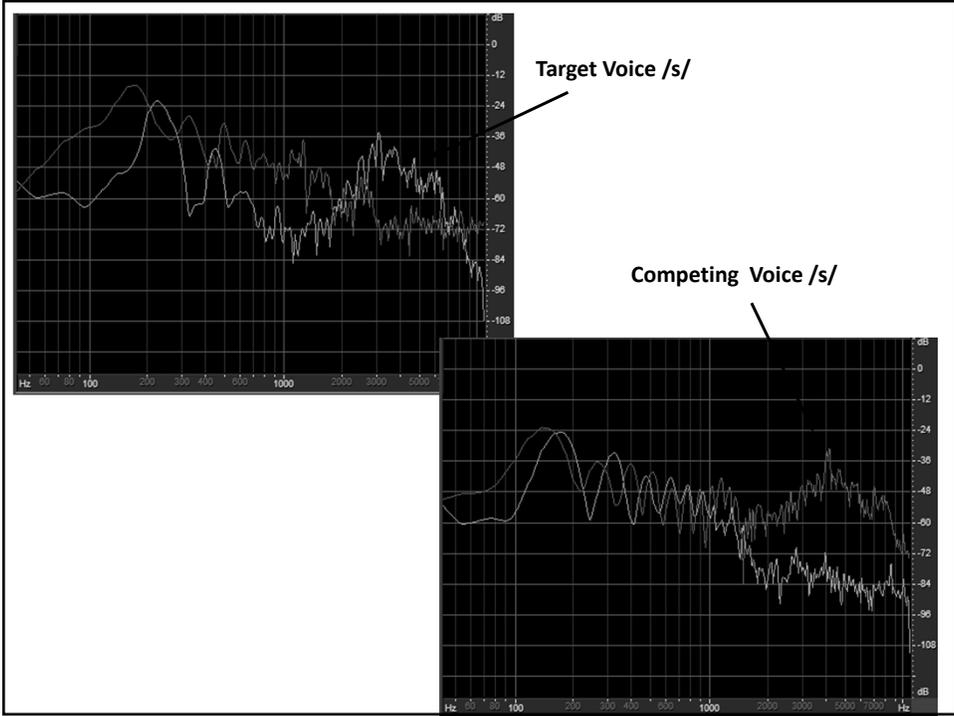
The Speech Signal up Close

Broad Band? Narrow Band?

“two weeks later”



t o w e e k s l a t e r



Achieving Speech Recognition

Individual acoustic events must stand out of the clutter well enough to become linked.

Achieving Speech Recognition

The “ah-ha” Moment

The Distortional Component of SNHL

How Do We Address It Currently?

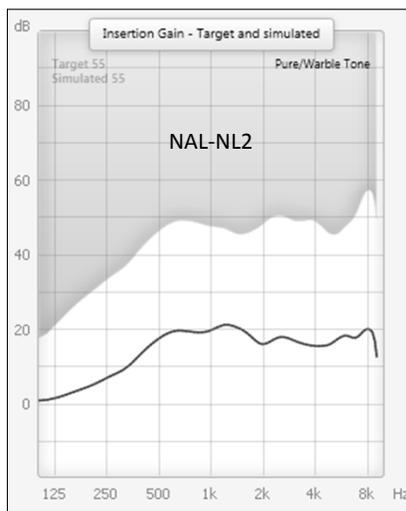
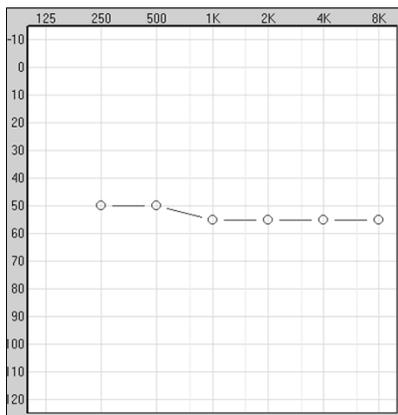
**Above all else:
Improve Audibility & the S/N**

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Improve Audibility & the S/N**

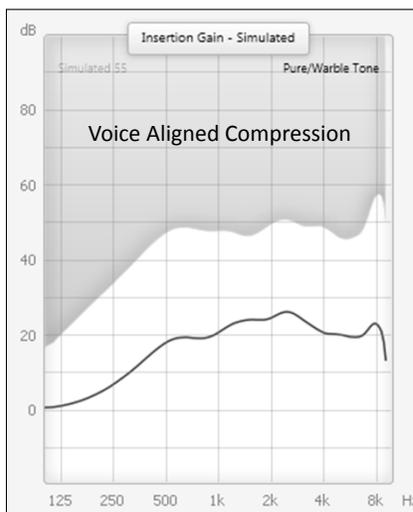
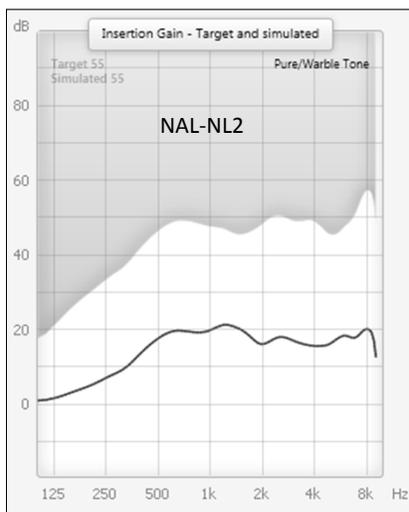
Increase the *chances* of “ah-ha”

Control the Lows

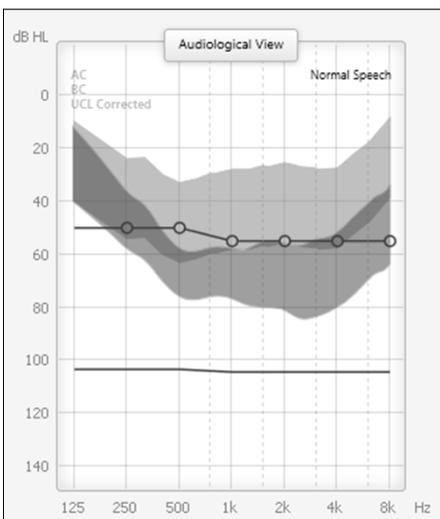
Control the Lows



Control the Lows

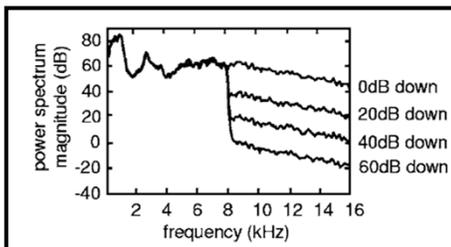


Control the Lows

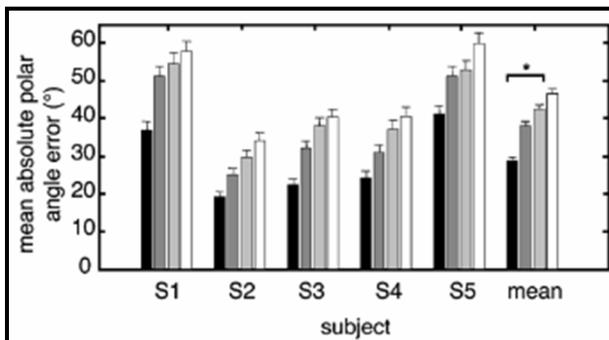


Increase the Bandwidth

Importance of HFs on Speech Localization



Best et al., 2005



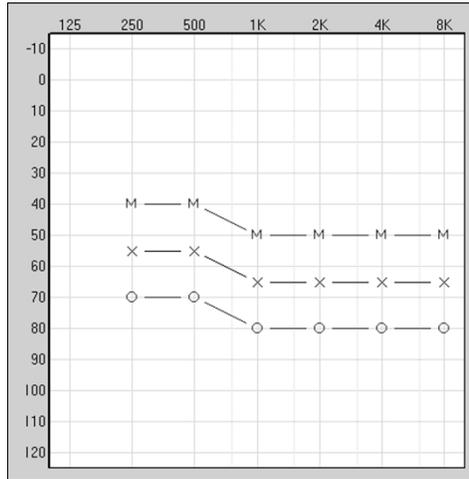
A Closer Look at MC-WDRC

A Closer Look at MC-WDRC

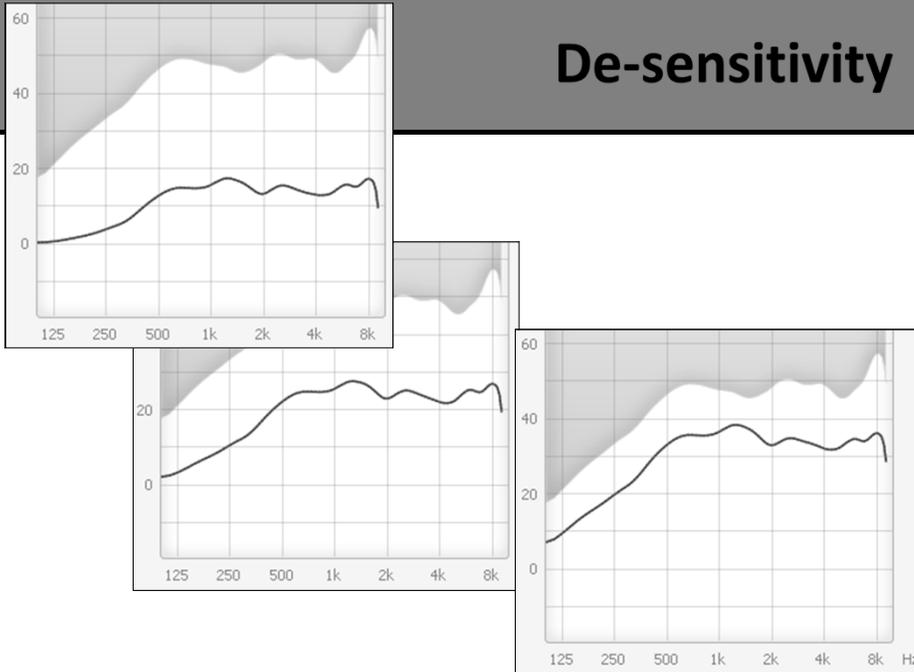
- Enhanced Audibility with Comfort
- Decoupling response to vowels from consonants (USOM)
 - Packaging with Care

De-sensitivity

De-sensitivity



De-sensitivity

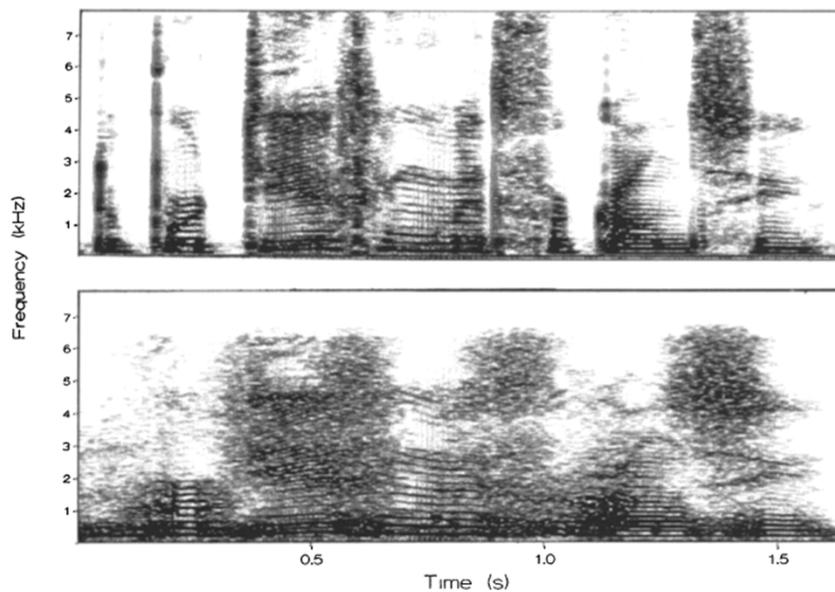


The Distortional Component of SNHL

The Future?

Further S/N Improvements?

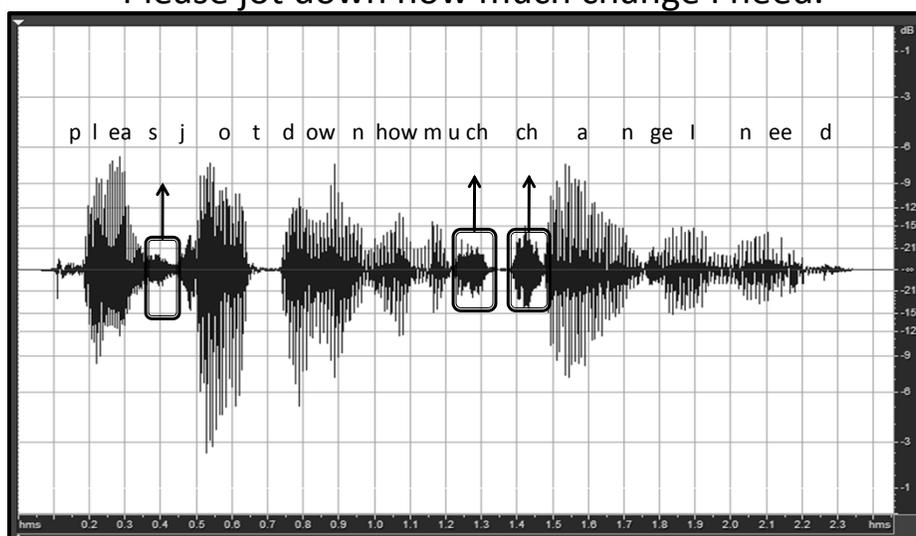
Reverse Engineering of SNHL

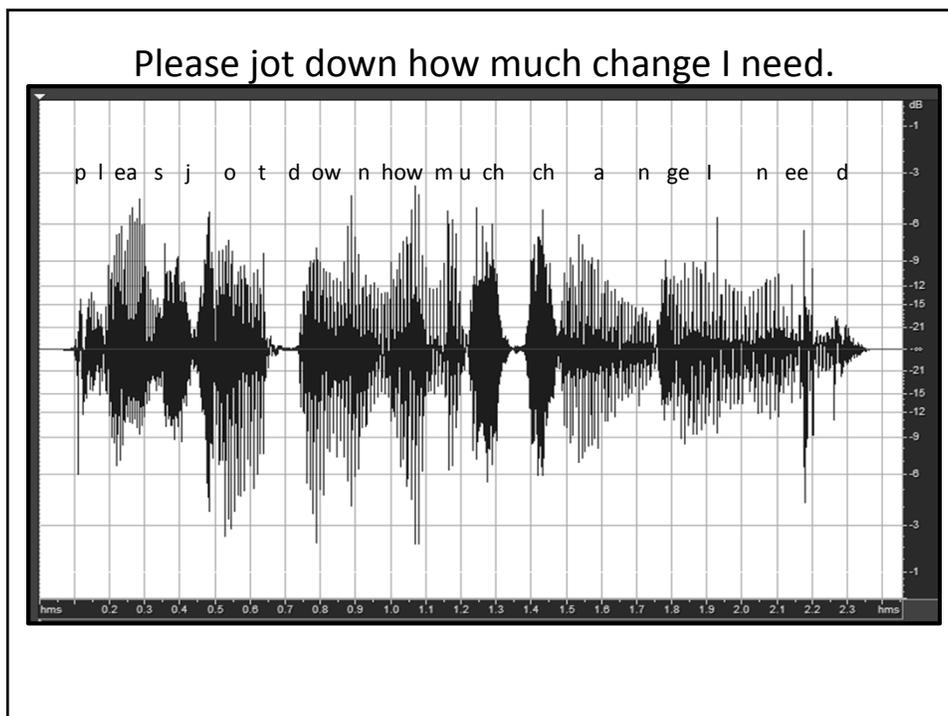


Drullman, Festen & Plomp, 1994

Phoneme Enhancement

Please jot down how much change I need.





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